



Idaho National Engineering and Environmental Laboratory
A Facility Operated for the U.S. Department of Energy

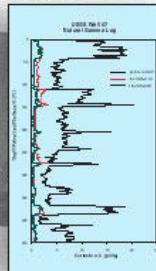
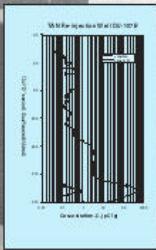
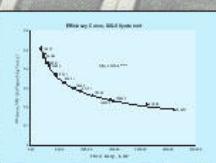
High Resolution Gamma Spectroscopy Well Logging System

J.R.Giles, R.R. Brey, T.F. Gesell, and K.J.Dooley, S.L. Barrie
Idaho State University and Lockheed Martin Idaho Technologies Company

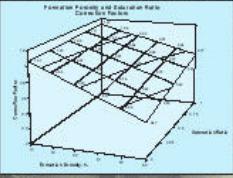


A Gamma Spectroscopy Logging System (GSLS) has been developed to study sub-surface radionuclide contamination. Absolute efficiency calibration of the GSLS was performed using simple cylindrical geometry. More complex borehole geometries were modeled using commercially available shielding software and correction factors were developed based on relative photon fluence rates. Examination of varying porosity and moisture content showed that as porosity increases, and as the formation saturation ratio decreases, relative photon fluence rates increase linearly for all energies. Correction factors for iron and water cylindrical shields were found to agree with previous studies. Regression analyses of correction factor data produced equations for correction factors applicable to spectral gamma-ray well logs acquired under non-standard borehole conditions.

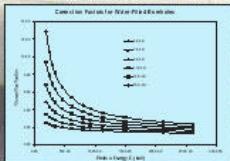
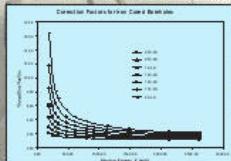
Application of the efficiency function and correction factors to spectral data allows more accurate quantitative estimations of naturally occurring and man-made radionuclides in the subsurface.



Correction factors for formation porosity and saturation ratio are independent of energy under conditions of infinite cylindrical source geometry



Correction factors were also developed for water-filled and cased boreholes and agreed well with existing data



The GSLS can be used for routine environmental monitoring, as a verification tool for remediation activities, and for post closure monitoring.

